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GMO Risks, Food Security, Climate Change and the Entrenchment of Neo-Liberal Legal Narratives.

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Keywords: GMOs; Risk Regulation; Food Security; Climate Change; Neo-Liberalism.

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This article explores the artificial nature of the neo-liberal legal narratives on GMOs, complementing Anne Saab's analysis of the Public International Law ('PIL') climate change adaptation regime with a deconstruction of the hegemonic transnational legal discourse on the risks, costs and benefits of agricultural biotechnologies. The enquiry into the dominant regulatory approach to the governance of GMO risks sheds light on its specific political and socio-economic implications, lending support to the argument that GMOs are identified as a strategy to tackle food insecurity and facilitate climate change adaptation simply because their development, patenting and trade serve the profit-making goals of transnational market actors. Against this backdrop, the PIL discourse on climate-resilient GMOs and the hegemonic transnational legal narrative on GMO safety and food security turn out to be two sides of the same coin.

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What are the connections between climate change, the development of international climate change adaptation strategies, GMO patenting and trade and the entrenchment of a GMO-led food security paradigm? What lies at the heart of the legal narratives on GMO risks, GMOs and food security and GMOs and climate change? This article endeavours to sketch out an answer to these questions. The analysis unfolds against the twofold backdrop of Public International Law (hereafter, 'PIL') responses and transnational legal paradigms, complementing Saab's analysis of the PIL regulatory framework on climate change adaptation[1] with an enquiry into the hegemonic transnational legal narrative on the risks, costs and benefits of agricultural biotechnologies.[2]

Section 1., drawing on Saab's work on climate-resilient GM crops, starts off with a PIL overview of GMO-led strategies to facilitate climate change adaptation and tackle food insecurity; it specifically emphasises the connection between the – alleged – need to increase agricultural production through GMOs and the need to safeguard and strengthen the intellectual property rights of biotech companies. Section 2., on the other hand, explores the dominant transnational legal narrative on GMO risk regulation, deconstructing its political and socio-economic implications and its direct connections to the elimination of non-tariff barriers to trade, transnational regulatory convergence and further trade liberalisation.[3]

Section 3. concludes by casting some light on the social embeddedness and artificial construction of all neo-liberal legal narratives on GMOs. Are GM crops 'safe' for public

[1] Anne Saab, 'Climate-Resilient Crops and International Climate Change Adaptation Law' (2016) 29(2) *Leiden Journal of International Law* 503.
[2] Giulia Claudia Leonelli, *The Transnational Law and Governance of GMOs* (under peer review, on file with author).
[3] For an in-depth deconstruction of the foundations and implications of the hegemonic legal narrative on GMO risks, see Leonelli (n. 2). For a broader overview on transnational risk regulation, see Giulia Claudia Leonelli, 'A Closer Look at Transnational Risk Regulation: Transnational Law As A Methodology and Critical Theory' (forthcoming, on file with author).

health, the environment and biodiversity? Are they going to feed the world and tackle food insecurity? And are they a viable strategy to achieve climate change adaptation?

1. PIL Frameworks: Climate Change Adaptation, Climate-Resilient GM Crops, Food Security and the TRIPs Agreement.

Climate-resilient GM crops, genetically engineered[4] to achieve environmental resistance to drought or flooding, are just one of the latest metamorphosis of agricultural biotechnologies.[5] Whilst GMO supporters argue that this specific application of bio-engineering techniques will play a key role to increase global agricultural production, in the face of climate change, there is almost nothing new in this discourse on the presumed benefits of GMOs. Indeed, throughout the years, agricultural biotechnologies have in turn been alleged to result in a reduction in the use of herbicides and insecticides – in so far as GM crops are engineered to achieve herbicide tolerance and insect resistance;[6] to increase agricultural productivity, cuttings costs for both farmers and consumers; to pave the way for the development of nutritionally enhanced and vitamin-fortified crops;[7] and to serve the purpose of feeding an expanding global population, tackling starvation and food insecurity in developing and less developed countries.[8] Most famously, upon a refusal by Mozambique, Zambia and Zimbabwe to accept a US donation of GM foods, the former USA President G.W. Bush contended that the EU precautionary approach to GMO risks had obstructed the global fight for food security, urging the EU to end its opposition to GMOs *'for the sake of a continent threatened*

[4] Under the Cartagena Protocol on Biosafety, articles 1 and 4, 'modern biotechnology' is defined as encompassing the application of in vitro nucleic acid techniques, including recombinant DNA and direct injection of nucleic acid, as well as the fusion of cells beyond the taxonomic family, overcoming physiological barriers and traditional breeding selection. See <https://bch.cbd.int/protocol> (last accessed 12/02/2018). For a different definition of GMOs, as laid out under EU law, see Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the Deliberate Release into the Environment of Genetically Modified Organisms and Repealing Council Directive 90/220/EEC OJ [2001] L106/1, Annex I A.

[5] The genetic modification of crops is aimed at achieving herbicide tolerance, to better control weeds; insect resistance; environmental resistance to drought or flooding; and disease resistance. In a few cases, crops have been genetically engineered to alter their nutritional qualities or to target consumer related-features. For more information, see <http://geneticliteracyproject.org> (last accessed 12/02/2018). At the time of writing, the only climate-resilient GM crop variety approved in the US is Monsanto's 'droughtgard' (MON 87460) drought resistant corn; see <http://www.genuity.com/corn/Pages/DroughtGard-Hybrids.aspx> (last accessed 12/02/2018).

[6] Herbicide resistant crops are estimated to be about 53% of GM crops; it is worth noting that the same biotech corporations which hold patent rights for herbicide resistant GM crops are also, in most cases, the producers of the specific herbicide products GMOs are resistant to. A plurality of environmental organisations have provided evidence that herbicide resistant crops, far from reducing the employment of herbicides, have in fact caused a remarkable intensification in their use, as weeds gradually develop increased resistance. See <http://www.gmwatch.org/news/latest-news/17338-superweeds-it-s-game-over-for-gm-herbicide-tolerant-crops> and < http://stopthecrop.org/toxic-crops> (last accessed 12/02/2018). For more information about the decline in use of 'Roundup' and the turn to 'Dicamba', due to the increased herbicide resistance of so-called 'Super-Weeds', and for an overview of the significant problems posed by the use of 'Dicamba' and '2, 4-D' – with all ensuing state measures in the USA, see <http://www.gmwatch.org> (last accessed 12/02/2018). For an overview of the glyphosate – i.e. 'Roundup' – controversy and the 'Monsanto Papers' issue, see <https://www.reuters.com/article/us-monsanto-cancer-lawsuit/monsanto-ordered-to-pay-289-million-in-worlds-first-roundup-cancer-trial-idUSKBN1KV2HB> (last accessed 10/08/2018).

[7] Inter alia, see <http://www.gmwatch.org/en/articles/gm-myths> (last accessed 12/02/2018).

[8] *Ibid.*

by famine'.[9] Indeed, the linkage between climate change adaptation strategies and trade in climate-resilient GM crops is nothing but the latest – and somehow natural – evolution of the hegemonic legal discourse on GMOs.

Saab's accurate analysis has documented how the legal narrative on the value of climate-resilient GM crops to adapt to the effects of climate change and increase global agricultural production has by now entrenched in all PIL frameworks for the governance of climate change adaptation.[10] Her enquiry into the 'international climate change adaptation law regime'[11] has focused on the main PIL regulatory instruments, i.e. the 1992 United Nations Framework Convention on Climate Change ('UNFCCC') and the 1997 Kyoto Protocol,[12] the UNFCCC technical papers, the assessment reports of the Intergovernmental Panel on Climate Change ('IPCC') and all relevant international adaptation standards and initiatives.[13]

To begin with, her analysis has testified that *'the accent in discourse about climate change impacts on agriculture is on declining crop yields'*;[14] this has directly concurred to frame the challenges of climate change adaptation in the agricultural sector in terms of a set of strategies to increase food production.[15] Further than that, the overarching goal of tackling the effects of climate change by increasing global food production is explicitly connected to market-led strategies. Whilst Article 10(c) of the Kyoto Protocol already stated that all parties shall cooperate in the creation of an enabling environment for the private sector, promoting the development of new and environmentally 'sound' technologies,[16] the focus and emphasis on the role of private sector actors in devising climate change adaptation strategies for the agricultural sector has dramatically increased throughout the years. This is where climate-resilient GM crops come into play.

As Saab's detailed analysis has shown, references to climate-resilient GMOs are ubiquitous in international climate change adaptation law frameworks. Paragraphs 55, 58, 206, 216 and 221 of the 2006 UNFCCC technical paper explicitly mention drought-resistant seeds and/or gene technologies as viable and desirable options to contribute to climate change adaptation.[17] The 2000 IPCC Special Report on 'Methodological and Technological Issues in Technology Transfer' extensively deals with the matter of 'Genetic Improvements Critical to Climate Adaptation',[18] lamenting the decline in public funding for agricultural biotechnologies and defining the transnational controversies over the uncertain risks posed by GMOs as a significant concern for the implementation of climate change adaptation strategies.[19] The IPCC fourth assessment report expressly refers to climate-resilient GMOs,

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[9] For a reference to this speech, see Mark Pollack and Gregory Shaffer, *When Cooperation Fails. The International Law and Politics of Genetically Modified Foods* (Oxford University Press, 2009) 116.

[10] Saab (n. 1).

[11] *Ibid.*, 507.

[12] *Ibid.*, 505. As Saab notes, the UNFCCC and the Kyoto Protocol stand as a regulatory framework within which responses to climate change are negotiated; as such, the two constitute the international legal framework on climate change and climate change adaptation.

[13] *Ibid.*, 507.

[14] *Ibid.*, 508.

[15] As noted at 508, Article 2 of the UNFCCC, in the face of the challenges posed by climate change, lists the 'adequate availability of food' as one of its objectives.

[16] *Ibid.*, 524.

[17] *Ibid.*, 523.

[18] *Ibid.*, 522, where Saab expressly refers to Section 11.3.3. of the Special Report.

[19] *Ibid.*, 522, where Saab expressly refers to Section 11.3.5. of the Special Report.

with a specific focus on drought, disease, pest and salt-tolerant varieties; equally, the IPCC fifth report remarks that GM crops are a possible adaptation option to enhance yields in the face of climate change.[20] Finally, a plurality of international adaptation initiatives – such as the Cancun Adaptation Framework and the National Adaptation Programmes of Action – have advocated the further development and commercial upscaling of climate-resilient GMOs.[21]

On these grounds, Saab has rightfully concluded that the field of international climate change law is actively promoting the development and use of climate-resilient GM crops, creating an enabling environment for market actors to devise and implement climate change adaptation strategies.[22] Further than that, the dominant legal discourse in PIL has established a direct connection between the need to *increase agricultural production* through *climate-resilient GMOs*, in order to *adapt to climate change* and tackle *food insecurity*, and the need to safeguard and strengthen the *intellectual property rights* of biotech corporations, which develop and patent climate-resilient GM crops.[23] These safeguards rely on the Agreement on Trade-Related Aspects of Intellectual Property (TRIPs).[24]

It is beyond any reasonable doubt that the TRIPs Agreement serves the purpose of protecting the profit-making prospects of transnational corporations and market actors;[25] indeed, the privatisation and commodification of public goods – in this case, seeds – has been the object of heated scholarly and societal debate.[26] However, and besides this specific aspect, the broader PIL linkage between the development and entrenchment of climate-resilient GMOs, the challenges posed by climate change and the food security debate triggers an array of different and more complex questions. Is the PIL climate change framework contributing to devise a strategy for the achievement of *climate change adaptation* and *food security*, or is it rather – or primarily – serving the *market interests* of transnational biotech corporations, just like the TRIPs Agreement does? Is the recurrent PIL narrative on the crucial role of climate-resilient GMOs – merely – ancillary to free trade in GM crops?

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[20] *Ibid.*, 520.

[21] *Ibid.*, 520 and 521.

[22] *Ibid.*, 527 and 528. See also the ActionAid *'Clever Name, Losing Game?'* report, available at <http://www.actionaid.org/sites/files/actionaid/csag_clevernamelosinggame_0.pdf> (last accessed 12/06/2018). The notion of 'Climate Smart Agriculture', encompassing the development and use of climate-resilient GM crops, was originally developed by the Food and Agriculture Organisation ('FAO') and the World Bank; as the ActionAid report highlights at 2, *'a number of industrialised countries (the US in particular), along with a number of agribusiness corporations, are now the most enthusiastic promoters of the concept'*. Sections of the scientific community also support the development of climate-resilient GM crops; for more information see infra (n. 27).

[23] Saab (n. 1), 527, drawing on Section 11.3.4. of the UNFCCC Report – which explicitly refers to the lack of intellectual property rights as an obstacle to private sector investment in climate-resilient seeds.

[24] And, specifically, on Article 27.3(b) therein. For the full text of the Agreement, see <https://www.wto.org/english/docs_e/legal_e/27-trips.pdf> (last accessed 12/02/2018). For further information, see also Anne Saab, 'Climate-Ready Seeds and Patent Rights: A Question of Climate (In)Justice?' (2015) 15(2) *Global Jurist* 219.

[25] The point which is debatable and open to challenge is, rather, whether furthering trade liberalisation and transnational market access will *also* serve the broader public interest through wealth maximisation, positive spill-overs and – ultimately – transnational wealth redistribution: see infra, section 2.

[26] See inter alia Holger Hestermeyer, *Human Rights and the WTO: The Case of Patents and Access to Medicines* (Oxford University Press, 2007); and Holger Hestermeyer, 'Reality or Aspiration? Solidarity in International Environmental and World Trade Law' in Holger Hestermeyer (ed.), *Coexistence, Cooperation and Solidarity: Liber Amicorum Rüdiger Wolfrum* (Martinus Nijhoff, 2012) 45.

On the one hand, it is worth highlighting that the effectiveness of climate-resilient GM crops is yet to be established. Not only there is no clear proof that using these GM seeds will result in an increase of crop yields, but also – and importantly – the same objectives may be achieved through the application of conventional breeding techniques.[27] On the other hand, the assumption whereby food insecurity will be tackled by a GMO-led strategy has been fiercely challenged by a plurality of NGOs and food sovereignty activists.[28]

At the heart of the dispute lies a divergent framing of the issues at stake in the debate. The dominant narrative, as reflected in the position of inter-governmental organisations[29] and PIL discourses, relies on the premise that GMOs will help improve agricultural productivity and increase food production, thus achieving food security. From a diametrically opposed perspective, NGOs and food sovereignty advocates point to issues of food distribution and food access, which an overall increase in food production cannot possibly tackle. Food insecurity has – in fact – always existed; the main obstacles to food security and access to food are thus identified in the long-standing exploitation of developing and less developed countries and in the socio-economic conditions of marginalised small-scale farmers – rather than in the production methods themselves.[30] As rightfully noted, whilst *'500 million small farms in developing countries already support the* [food needs of] *almost two billion people, nearly one third of humanity'*[31] through conventional or organic agriculture, 300 to 500 corporations and companies in the agri-business sector control 70% of the resources in the global food system.[32] In this light, the foundations of the debate are deeply rooted in the

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[27] For the view that further scientific and technological developments in agricultural biotechnologies are likely to facilitate climate change adaptation and increase yields, see National Academies of Sciences, Engineering and Medicines, *Genetically Engineered Crops: Experiences and Prospects* (The National Academies Press, 2016). For the opposite view, see the 2012 report of the Union of Concerned Scientists, *'High and Dry: Why Genetic Engineering Is Not Solving Agriculture's Drought Problem in A Thirsty World'*, available at <https://www.ucsusa.org/sites/default/files/legacy/assets/documents/food_and_agriculture/high-and-dry-report.pdf> (last accessed 12/06/2018). For an overview of the broad range of *non-GM* success stories, with a specific reference to drought tolerance, flood tolerance, salt tolerance, high yield and tolerance to specific soil and weather conditions, see <http://www.gmwatch.org/en/articles/non-gm-successes> (last accessed 12/02/2018); equally, for a defence of agroecological approaches to climate change adaptation, see the ActionAid *'Clever Name, Losing Game?'* report, supra (n. 22), 5 to 8. This lends support to the argument that conventional breeding could be just as effective – or even more effective – than genetic engineering for the purpose of developing climate-resilient crops.

[28] Among the various active networks, see La Via Campesina <https://viacampesina.org/en/> and the People's Coalition on Food Sovereignty <www.foodsov.org/> (last accessed 12/02/2018).

[29] The position of inter-governmental organisations – and particularly the Food and Agriculture Organisation ('FAO') – on GMOs has always been rather conciliating and diplomatic; despite acknowledging that agricultural biotechnologies have not delivered on many of their promises, the Food and Agriculture Organisation ('FAO') and World Health Organisation ('WHO') still regard GM products as an important vehicle for food security across developing and least developed countries. See inter alia FAO, *Biotechnologies for Agricultural Development. Proceedings of the FAO International Conference on Agricultural Biotechnologies in Developing Countries: Options and Opportunities in Crops, Forestry, Livestock, Fisheries and Agro-Industry to Face the Challenges of Food Insecurity and Climate Change* (FAO, 2011); and FAO, *FAO International Symposium on the Role of Agricultural Biotechnologies in Sustainable Food Systems and Nutrition* (FAO, 2016).

[30] For more information see Terry Marsden, Kevin Morgan and Johnathan Murdoch (eds.) *Worlds of Food. Place, Power and Provenance in the Food Chain* (Oxford University Press, 2006); Jennifer Clapp and Doris Fuchs, *Corporate Power in Global Agrifood Governance* (MIT Press, 2009); Terry Marsden and Adrien Morley (eds.) *Sustainable Food Systems. Building A New Paradigm* (Routledge, 2014).

[31] <https://www.oxfam.org/en/campaigns/grow-frequently-asked-questions> (last accessed 12/02/2018).

[32] *Ibid.*

eternal dilemma of (neo)-liberalism: will aggregate wealth *maximisation* eventually pave the way for wealth *redistribution*? Will trade in GMOs in fact result in positive spill-overs, and will it help fight food insecurity? GMO advocates and food sovereignty activists could not disagree more in this specific respect.

Against this background, it is ultimately unclear whether climate-resilient GMOs could be a viable and desirable strategy for climate change adaptation and food security. Equally, it is legitimate to question whether the PIL discourse on GMOs, climate change and food security is nothing more than an artificial legal narrative, serving the profit-making purposes of transnational market actors. The next section analyses the heated transnational debate on the uncertain risks posed by GMOs; by looking at the GMO conundrum through the lens of transnational risk regulation, it will shed further light on the social embeddedness and artificial construction of the PIL narrative on GMOs, climate change adaptation and food security.

2. One Step Further: GMO Risks and the – Complementary – Legal Narrative on Sound Science and Cost-Benefit Analysis.

Neo-liberal legal narratives on GMOs have unfolded well beyond PIL, well beyond the inter-governmental dimension and well beyond the fields of climate change and food security. This is clear from a deconstruction of the hegemonic transnational narrative on the regulation of GMO risks,[33] and from an analysis of its political and socio-economic implications.[34]

Further than that, and as anticipated at the end of section 1., casting light on the foundations of the dominant transnational narrative on GMO risks lends support to the argument that the discourse on GMOs, climate change adaptation and food security primarily serves the interests of transnational market actors. From this perspective, the emphasis of the PIL climate change regime on climate-resilient GM crops and the hegemonic transnational discourse on the risks, costs and benefits of agricultural biotechnologies turn out to be two sides of the same coin. GMOs are held to play a key role to achieve climate change adaptation and food security simply *because* GMO development, patenting and trade responds to the profit-making goals of market actors; symmetrically, sound science and Cost-Benefit Analysis ('CBA') have come to dominate the landscape of transnational risk regulation and transnational GMO regulation *because* they are ancillary to transnational regulatory convergence, the elimination of non-tariff barriers to trade and – consequently – transnational market access and further trade liberalisation.[35] Both GMO narratives are artificially constructed and embedded in a neo-liberal paradigm of transnational governance;

[33] Where the terminology of 'transnational' is structurally distinguished from the traditional inter-governmental perspective underpinning PIL; indeed, the transnational category casts light on the restructuring of societal activities and regulation *beyond* the nation state and *beyond* state-to-state interactions. For an introduction, see Peer Zumbansen, 'Transnational Legal Pluralism' (2010) 10(2) *Transnational Legal Theory* 141; and Terence Halliday and Gregory Shaffer, 'Transnational Legal Orders' in Terence Halliday and Gregory Shaffer (eds.) *Transnational Legal Orders* (Cambridge University Press, 2015) 3.

[34] For an in-depth deconstruction of the social embeddedness and political and socio-economic implications of transnational GMO regulation, see Leonelli (n. 2).

[35] *Ibid.*

further than that, and importantly, these two narratives turn out to be complementary and mutually reinforcing.

The dominant transnational discourse on 'evidence-based'[36] risk regulation relies on a sound science approach to risk assessment and on the application of CBA heuristics to risk management.[37] A sound science approach to technical risk assessment postulates a direct focus on what science has proved and quantified, rather than on the relevant margins of scientific uncertainty and the importance attached to the specific values at stake. CBA, on the other hand, mandates that uncertain risks shall only be regulated if – and in so far as – risk regulation is liable to maximise the expected aggregate utility of society, in terms of economic wealth. Under CBA, the economic-pecuniary costs that risk regulation would shift onto market actors are thus quantified and weighed against any potential public health and environmental benefits: as a result, risk regulation will only be enacted if it is held to be cost-benefit effective.[38]

The hegemonic transnational legal narrative on GMO risks is a perfect exemplification of this approach. To begin with, GMO supporters have consistently argued that there is no direct and unequivocal scientific evidence that GMOs may pose any risks to public health, the environment and biodiversity. Secondly, they point to the economic costs that a precautionary approach to the governance of GMO risks would shift onto market actors, preventing further technological developments and obstructing transnational trade. Finally, they argue that GMOs are liable to yield benefits to producers and consumers, increasing agricultural production at the global level and thus contributing to fight food insecurity in developing or less developed countries. On these grounds, the economic costs of a stringent approach to GMO risks are held to outweigh any public health and environmental benefits ensuing from precautionary GMO regulation. A sound science and cost-benefit effective approach to GMO regulation is held to maximise aggregate societal wealth, thus resulting in positive spill-overs and transnational wealth redistribution. Precautionary approaches, on the other hand, have been famously defined as an *'infantile disease'* of risk regulation,[39] or as *'laws of fears'*.[40]

On the other side of the barricade, a diametrically opposed discourse on precautionary risk governance (originally) developed in the EU[41] and has since then expanded at the transnational level. A 'socially acceptable risk' approach to risk regulation[42] calls for a 'prudential'[43] technical risk assessment, whereby due consideration shall be given to what science cannot prove and establish in the face of scientific uncertainty. Symmetrically, risk

[36] For the terminology of 'evidence-based' risk regulation see Alberto Alemanno, 'Risk Versus Hazard and the Two Souls of EU Risk Regulation: A Reply to Ragnar Lofstedt' (2011) 2(2) *European Journal of Risk Regulation* 169.

[37] For a detailed overview, see Leonelli (n. 2) and (n. 3).

[38] Again, for a detailed overview, see Leonelli (n. 2) and (n. 3).

[39] Giandomenico Majone, 'Foundations of Risk Regulation: Science, Decision-Making, Policy Learning and Institutional Reform' (2010) 1(1) *European Journal of Risk Regulation* 5, at 16.

[40] Cass Sunstein, *Laws of Fear. Beyond the Precautionary Principle* (Cambridge University Press, 2005).

[41] For an analysis of the gradual – albeit discontinuous – decline of this discourse under EU risk regulation, see Leonelli (n. 2).

[42] For an exhaustive definition of 'socially acceptable risk' approaches to risk governance, within and beyond the EU, see Leonelli (n. 2).

[43] For the distinction between 'prudential' risk assessment and 'precautionary' risk management see European Commission, *Communication from the Commission on the Precautionary Principle*, COM (2000) 1 Final, at 12 (Section 5).

management involves the weighing and balancing of all interests at stake and a political – rather than economic – determination of the threshold of socially acceptable risk. In other words, a 'socially acceptable risk' approach to risk governance is meant to address whether a risk is acceptable and worth running in the light of scientific uncertainty, the values at stake, the intended level of protection,[44] the pervasiveness of any potential hazards and a range of other legitimate factors ('OLFs')[45] – encompassing enhanced consumer protection, environmental sustainability, socio-economic fairness and distributional stakes.

The counter-hegemonic transnational legal narrative on GMOs and GMO risk regulation is permeated by this approach. First of all, GMO opposers have constantly pointed to persisting scientific uncertainty over the long-term, indirect and unforeseeable impact of GMOs on public health, the environment and biodiversity.[46] Secondly, they have consistently argued that the uncertain risks posed by GMOs are not socially acceptable and not worth running in the light of the intended level of public health and environmental protection and the specific OLFs at stake. The latter do not only include the public perception of GMO risks, environmental sustainability and the importance attached to alternative (conventional and organic) models of agriculture, but also a range of distributional implications, which CBA heuristics unavoidably disregard.

As already mentioned, CBA underpins a calculation of the marginal economic costs and benefits of risk regulation, thus identifying the regulatory option which is expected to maximise *aggregate* societal wealth; nonetheless, the CBA toolbox is completely silent on *distributional* issues. Which constituency will bear the costs of risk regulation, and which constituency will benefit from them? CBA cannot provide any answer to these questions, in so far as its goal is merely to identify an aggregate value: under this methodological approach, redistribution effects and positive spill-overs[47] are in fact nothing more than a

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[44] See e.g. European Commission, *Communication from the Commission on the Precautionary Principle* (n. 43) at 12 (section 5) and 16 (section 6.2.): when in the face of scientific uncertainty, and upon a technical risk assessment, there are reasonable grounds to believe that a potential risk may *be inconsistent with the chosen level of health and environmental protection,* risk managers shall take a decision as to whether to act, and how to act. See also Recitals 8 and 21 and Article 5 of Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002 Laying Down the General Principles and Requirements of Food Law, Establishing the European Food Safety Authority and Laying Down Procedures in Matters of Food Safety [2002] OJ L31 (the General Food Law, 'GFL') whereby, in the face of scientific uncertainty, the precautionary principle provides a mechanism for determining risk management measures to ensure the *high level of health protection chosen.*

[45] Notably, in this perspective, see recital (19) and articles 5, 6(2), 6(3) and 7(2) of the GFL (n. 44). Article 6(3) maintains that *'risk management shall take into account the results of risk assessment* […]*, other factors legitimate to the matter under consideration, and the precautionary principle where the conditions laid down in article 7(1) are relevant* […]*'*. A similar clause can be found in recital (32) of Regulation (EC) No. 1829/2003 of the European Parliament and of the Council of 22 September 2003 on Genetically Modified Foods OJ [2003] L268/1, stating that *'it is recognised that* […] *scientific risk assessment alone cannot provide all the information on which a risk management decision should be based, and that other legitimate factors* [OLFs] *relevant to the matter under consideration may be taken into account'.*

[46] On the uncertain risks that GMOs may pose to public health, see for example the ENSSER – European Network of Scientists for Social and Environmental Responsibility – website at <http://www.ensser.org/> (last accessed 12/02/2018). See also <http://www.gmwatch.org/news/latest-news/17356-cultivation-of-gm-maize-in-the-eu-must-be-suspended-legal-dossier> and <https://www.euractiv.com/section/agriculture-food/opinion/new-gm-crops-once-again-fail-the-safety-test/> focussing on the risks to the environment and to biodiversity flowing from the Syngenta's Bt11 and Pioneer's 1507 GM maize varieties; and <https://www.organic-center.org/reportfiles/GE13YearsReport.pdf> (last accessed 12/02/2018).

[47] Just like the original and most famous Adam Smith's definition of the 'invisible hand'.

working assumption. This lends support to the argument that the dominant evidence-based paradigm of risk regulation shifts *economic costs* away from market actors, allocating *diffuse externalities* to a range of different constituencies;[48] in other words, evidence-based approaches are – methodologically – liable to allocate economic benefits to market actors, while shifting diffuse – consumer protection, environmental and socio-economic – costs onto broader constituencies. Further than that, and crucially, this factor lies at the core of the argument that GMOs will *not* tackle food insecurity, in so far as the latter has always been caused by issues of food *distribution* and *access* to food.

A plurality of transnational NGOs have argued that the development, patenting and commercialisation of GMOs have only benefited transnational corporations, serving their profit-making interests while perpetuating distributional conflicts and inequalities across developed, developing and less developed countries. NGOs claim that several transnational constituencies are bearing the costs and running the diffuse risks associated to agricultural biotechnologies, while a limited group of market actors are capitalising on their economic benefits. From this perspective, NGO actors and food sovereignty activists have in fact directly challenged the 'myth' that the benefits of GMOs will spill over onto consumers and farmers in developing and less developed countries; and indeed, it is important to highlight that all transnational regulatory standards enacted by NGO actors categorically prohibit the cultivation or use of any GM varieties by farmers.[49]

Against this overall backdrop, and to conclude this brief overview, the counter-hegemonic transnational legal narrative on GMOs paves the way for a diametrically opposed approach to the governance of agricultural biotechnologies. Indeed, the uncertain public health and environmental risks and the socio-economic costs of GMOs are held to considerably outweigh any potential benefits that agricultural biotechnologies may ever yield. For this reason, precautionary approaches to GMO risk regulation are strongly defended and supported within, across and beyond the nation state level.

What conclusions are we to draw from this analysis? To begin with, it is worth remarking that both transnational legal narratives – the discourse on evidence-based risk regulation as well as 'socially acceptable risk' approaches – are *socially embedded* and *socially constructed*. Although the denigrators of the precautionary principle are used to contrasting an 'objective', 'neutral' and 'universal' evidence-based approach to 'politicised' precautionary approaches, there is nothing 'sound' in sound science;[50] equally, CBA

[48] For a further development of this point, see Leonelli (n. 2).

[49] The regulatory standards enacted by the most important transnational NGOs – i.e. IFOAM Organics International, Fair Trade International, Pro Terra Foundation, Slow Food – and certified under ad hoc accreditations systems set out a clear and unequivocal prohibition of GMO cultivation. The position of Slow Food and its constituent networks on agricultural biotechnologies could not be any clearer: a statement from the organisation lists and explains the many reasons why Slow Food is directly opposed to GMOs. These range from safety reasons – with a specific focus on human and animal health – to environmental reasons – such as the many risks to biodiversity and the contamination of crops and soils – and socio-economic reasons – to begin with corporate control, the myth of GMO development as the way forward to achieve food security, and the threat that GMOs directly pose to small-scale farmers and traditional food cultures; see <https://www.slowfood.com/what-we-do/themes/gmos/why-we-are-against-gmos/> (last accessed 12/02/2018). For an analysis of the regulation of GMOs by transnational no-profit actors, see Leonelli (n. 3).

[50] See inter alia Vern Walker, 'The Myth of Science as a Neutral Arbiter for Triggering Precautions' (2003) 26(2) *Boston College International and Comparative Law Review* 197; Sheila Jasanoff, *Designs on Nature. Science and Democracy in Europe and the United States* (Princeton University Press, 2005); Maria Lee, *EU*

heuristics rely on an inherently value-laden determination and quantification of the notions of 'cost' and 'benefit'.[51] In fact, the divergence between the two approaches boils down to the *procedural* application of quantitative methodologies and heuristics versus qualitative criteria,[52] which in turn results from the different framing of a range of *substantive* – political and socio-economic – stakes.[53] Divergent approaches to risk regulation ultimately reflect different *'designs on nature'*[54] and *'socio-technical imaginaries'*:[55] nonetheless, the determination that a risk is acceptable and worth running is always and unescapably socially embedded.

Building on this consideration, it is worth looking back at the foundations of the hegemonic legal narrative on GMOs. If both the evidence-based and the 'socially acceptable risk' paradigms are socially embedded and socially constructed, why is the hegemonic legal narrative on GMO risks unequivocally rooted in the evidence-based approach? It is legitimate to suggest that the evidence-based approach has come to dominate the landscape of transnational GMO risk regulation simply *because* it is ancillary to transnational regulatory convergence, the elimination of non-tariff barriers to trade and – consequently – transnational market access.[56]

From this perspective, and as anticipated since the opening of this section, the analysis of the hegemonic transnational narrative on GMO risk regulation sheds light on the artificial nature of the PIL discourse on climate-resilient GM crops. GMOs are held to play a key role in climate change adaptation and food security debates *because* their development, patenting and trade responds to the profit-making goals of market actors, just like evidence-based approaches to GMO risk regulation have entrenched *because* they facilitate and underpin transnational regulatory convergence and trade liberalisation. The two narratives, indeed, turn out to be two sides of the same coin.

3. Crumbling Mythologies and New Methods. The Case for Cross-Disciplinary Analysis.

As the analysis so far has endeavoured to show, both the PIL discourse on climate-resilient GMOs and the hegemonic transnational narrative on GMO risk regulation are artificially constructed. GMOs will not be a panacea for climate change and food insecurity; equally, there is nothing neutral, objective and universal about the contention that GMOs are safe and

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Regulation of GMOs (Edward Elgar, 2008); Michelle Everson and Ellen Vos (eds.), *Uncertain Risks Regulated* (Routledge, 2009); Maria Weimer and Anniek de Ruijter (eds.) *Regulating Risks in the European Union. The Co-Production of Expert and Executive Power* (Hart Publishing, 2017); and Leonelli (n. 2).

[51] See Leonelli (n. 2).

[52] *Ibid.*

[53] *Ibid.*

[54] Jasanoff (n. 50).

[55] Sheila Jasanoff and Sang-Hyun Kim (eds.) *Dreamscapes of Modernity. Socio-Technical Imaginaries and the Fabrication of Power* (Chicago University Press, 2015).

[56] For an in-depth analysis of how the – allegedly 'neutral', 'objective' and 'universal' – technocratic model of evidence-based risk regulation has in fact been merely instrumental to the achievement of transnational regulatory convergence and further trade liberalisation, see Leonelli (n. 2). For a shorter version of the argument, see Leonelli (n. 3).

that the uncertain risks that they pose are worth running, and should be run. Both hegemonic legal narratives are embedded in a neo-liberal approach to the governance of the challenges and externalities of globalisation.

One final question ensues from this consideration. To what extent are market actors part of the problem, and to what extent are they part of its solution? Whilst it would be far-fetched to argue that climate change and food insecurity have only or directly been caused by transnational market actors, it is beyond any doubt that globalisation as we know it – or, a 'neo-liberal' paradigm of globalisation – has exacerbated them. Although market actors are actively engaged under PIL frameworks to devise and implement climate change adaptation strategies, they do often stand as an obstacle in the way to climate change mitigation; the very framing of climate change discourses in terms of market-led adaptation, rather than mitigation,[57] is thus arguably the reflection of a neo-liberal approach. This is even easier to highlight in the context of food insecurity: although GMOs are alleged to feed the world, an unprecedented number of patents and trade rights for seeds, herbicides and insecticides are in fact concentrated in the hands of three transnational macro-corporations.[58] Again, to what extent are market actors part of the problem, and to what extent are they part of its solution? From this perspective, the legal narratives on GMO risk regulation, climate change and food insecurity are diverting the focus away from the problems caused or exacerbated by a neo-liberal model of globalisation: the contribution that market-led strategies may give to solve these complex problems, however, is at best limited.

Different transnational strategies and solutions are being obscured, neglected or discarded as a result of the entrenchment of artificial – neo-liberal – transnational legal narratives. Legal analysis is thus called upon to give its contribution, deconstructing law's social embeddedness and casting light on the political and socio-economic implications of different regulatory approaches. This will be all the more important, as globalisation progresses; and indeed, this is the challenge that methodological transnationalism[59] is striving to face.

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[57] For an express acknowledgment that the focus in PIL discourses has gradually shifted from issues of 'climate change mitigation' to strategies for 'climate change adaptation' see Saab (n. 1) at 505 and 506. This shift has become particularly clear, Saab argues, with the publication of the 2001 assessment report of the IPCC.

[58] Bayer and Monsanto have now merged into one macro-corporation; on the 7th of June 2018 Bayer AG reported it had completed its purchase of Monsanto Co., estimating the costs of the deal at around 63 billion dollars including debt. The company name will remain 'Bayer'; the 'Monsanto' brand, on the other hand, will no longer exist. Dow Agrosciences and DuPont's merger into the DowDuPont corporation was completed in mid-September 2017: see <https://www.dow.com/en-us/news/press-releases/dowdupont-merger-successfully-completed> (last accessed 12/02/2018). Finally, Syngenta was also purchased by ChemChina in May 2017: for more information, see <https://www.syngenta.com/media/media-releases/yr-2017/23-10-2017a> (last accessed 12/02/2018).

[59] See Zumbansen (n. 33); Peer Zumbansen, 'Neither Public Nor Private, National Nor International: Transnational Corporate Governance from a Legal Pluralist Perspective' (2011) 38(1) *Journal of Law and Society*, 50; Peer Zumbansen, 'Lochner Disembedded: The Anxieties of Law in a Global Context' (2013) 20(1) *Indiana Journal of Global Legal Studies* 29; Peer Zumbansen, 'Theorising as Activity. Transnational Legal Theory in Context', in Christopher McRudeen, Upendra Baxi and Abdul Paliwala (eds.) *Law's Ethical, Global and Theoretical Contexts. Essays in Honour of William Twining* (Cambridge University Press, 2015) 280; Leonelli (n. 2) and (n. 3).